

SPORTS INDUSTRY MEETS ACADEMIA: THE PEDAGOGICAL DEVELOPMENT OF AN MS DEGREE PROGRAM IN SPORTS PRODUCT DESIGN

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In the U.S., Portland, Oregon, is home to the sports product design industry. Jobs in this industry vary from entry-level retail assistants to CEOs, but the heart of it all revolves around designers and the inventive products they create. Becoming a successful designer can be very challenging and competitive, as undergraduate design and engineering programs in the U.S. provide basic skills but not industry-specific skills that fully allow designers to succeed in all divisions (apparel, footwear, and equipment) of the sports product industry. The University of Oregon, through a strategic initiatives effort, identified this opportunity and developed an integrative Master of Science graduate degree program in Sports Product Design. The program was created to include specialized courses from the departments of human physiology, journalism, business, and design to develop graduates proficient in using theories and creative problem solving skills to invent products that push the boundaries of athletic performance. Students learn how design can reduce athletic injuries and extend careers, improve performance, and address issues related to gender and diverse body types, including athletes with disabilities. This paper will review the creation of this one-of-a-kind program in the U.S., including pedagogical considerations, curriculum, and student inventions over the last three years.

Key words: Sports; Product design; Pedagogy

INTRODUCTION AND RATIONALE

“This is where it all began. This is where Bill [Bowerman] met Phil [Knight]. Where Gert [Boyle] pushed Tim [Boyle]. Where Wieden partnered with Kennedy. In short, this is the epicenter for innovation in the category. What Hollywood is to the movie industry, Portland [Oregon] is to the athletic & outdoor industry (1).”

In the U.S., Portland, Oregon, is home to the sports product design industry. Over 800 companies, including Nike, Columbia Sportswear, Adidas,

and Keen call the metro area their home (2). The industry employs over 141,000 workers and produces over four billion dollars in annual wages, according to the Oregon Business Plan (2). Jobs in this space vary from entry-level retail assistants to CEOs, but the heart of the industry revolves around designers and the inventive products they create. These products allow Olympians to win gold medals and inspire kids to “Be Like Mike” (3).

Becoming a successful designer in the sports product design industry can be very challenging and competitive. Multiple skills are needed, including the

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knowledge of soft and hard goods design, research and design process methodology, materials science, manufacturing, engineering, human physiology, biomechanics, business, and marketing. From first-hand experience, when a prospective university student in the U.S. considers sports product design as a career, they will pursue a degree in apparel/textile design, product/industrial design, or engineering. These degrees can be limiting, as they tend to teach design/engineering for a general area of interest (e.g., apparel, product, mechanical) at a very high level. Upon graduation, students with these degrees tend to be placed into “divisional roles” —apparel-only, footwear-only, or equipment-only — because the student did not learn all of the specialized processes, skills, and techniques needed to be successful across all divisions in the industry. Designers rarely cross over to other divisions. To illustrate how the aforementioned undergraduate design or engineering degrees in the U.S. can limit skills and job roles within the sports product design industry, the following table was created (Table 1).

So, how did this happen? The reason is quite simple: These degree programs were created at universities well before sports product design was ever

recognized as a viable employment option in the U.S. For example, apparel/textile design was established out of home economics programs in which students (mostly women) learned how to manage their homes and families. Industrial design was created as a result of the industrial revolution to teach students (mostly men) how to apply design principles to products that are manufactured through mass production. It was not until the mid-1980s that sports product design was an actual career choice, and, even then, there was not a great need for designers, as companies and their product lines were small. In addition, many products of the time were simple in design and did not require specialized skills. Many of the first sports footwear designers came from an educational background in architecture because of their familiarity with mechanical drawing — not footwear design. However, during the 1990s, skilled designers became highly sought after, as the industry exploded in size and the desire for revolutionary products was the way to the consumer’s heart.

PEDAGOGICAL CONSIDERATIONS

The University of Oregon, through a strategic initiatives effort, identified this opportunity and

Table 1. Typical Undergraduate Design or Engineering Degrees in the U.S. and Skill Limitations as Relates to Jobs in the Sports Product Design Industry

Undergraduate Degrees	Typical Jobs Post Graduation	Job Limitations	Skill Limitations
Apparel/textile design related undergraduate degrees	Assistant designer, technical designer, patternmaker, sample maker, materials developer, color designer – usually for in-line product teams	Graduates are limited to job roles in sports apparel or soft goods equipment design	Students do not learn about hard goods design, molded polymers, engineering, 3D CAD, human biomechanics, business, marketing, and sports product research/design innovation process
Industrial/product design or engineering related undergraduate degrees	Assistant designer or engineer – usually for in-line product teams	Graduates are limited to job roles in sports footwear or hard goods equipment design	Students do not learn about soft goods design, patternmaking, draping, sizing/fit, material/textile science, human physiology, business, marketing, and sports product research/design innovation process

developed an integrative graduate Master of Science (MS) degree program in Sports Product Design (SPD). An integrative approach was utilized, as it allows for interdisciplinary, concept-driven curriculum (4). This approach is valuable because it allows students to make connections between experiences and concepts to solve complicated problems for athletes. The program combines specialized courses from the departments of human physiology, journalism, business, and design to prepare students to be inventors. This educational model (integrative) provides an advantage to design students, as they can broaden their set of skills and have higher levels of learning and knowledge than in traditional programs (5). It provides a cumulative strategy, where courses early on in the program focus on prescribed theories and skills, which then later evolve into cognitive approaches that are more experimental (6). Lastly, this program model is more efficient, as, in the past, graduate students would have had to major or minor in multiple degrees in order to learn this knowledge.

The program was developed for students who already have a bachelor's degree in a design or engineering related discipline; individuals working in the sports product industry who want to pursue a master's degree in sports product design; or individuals working in the design industry who want to shift direction and focus on a sports product. Students coming into the program are expected to bring in strong foundational skills that they can build upon — with specialized sport product design skills, integrative thinking, and research — to become sports product design inventors.

Graduates of the program will have the ability to work fluidly across the three major product divisions of footwear, apparel, and equipment within companies in the sports industry. They will also be able to apply their skills at companies that specialize in Personal Protective Equipment (PPE)—the invention of new footwear, apparel, and equipment products for military operations, space travel, and firefighting. Because the program is integrative, students will obtain industry experience through internships, industry-sponsored projects, and working alongside mentors. The approach also fosters an entrepreneurial mindset, which allows designer candidates to turn product ideas (concepts) into intellectual property

(7). It is expected that graduates will enter the sports industry as leaders in innovation (long design timeline) or in-line design (short design timeline), or work as design strategists and researchers. The University of Oregon sees alums of this program as “game changers” who will revolutionize the industry by either creating their own sports product companies or working to invent revolutionary technologies for already established products (See Figure 1).



Figure 1. Sports Product Design (SPD) graduate student Kodi Whitfield inventing a new American football cleat.

PEDAGOGICAL MODEL

Sports Product Creation Organizations

Through an integrative approach, the SPD program was pedagogically set up to develop graduates proficient in using the appropriate theories and creative problem solving methods to invent new products for the sports industry. Because the industry is specialized, it was important that the learning model acknowledged how companies set up their product creation teams so that an alignment can be made between what students learn and the roles they may seek upon graduation. Having an industry-congruent teaching model provides students with a known structure, business goals, and skills, allowing them to fit more naturally into a company, understand their roles and responsibilities, and be immediately successful when they become professionals. The basis of the SPD pedagogical model was structured after how sports companies typically organize their product creation teams, with divisions for footwear, apparel, and equipment (Table 2).

Table 2. Typical Sports Company Product Creation Organization Model

Sports Company (e.g., Nike, Adidas, Under Armour)		
Sports Category (e.g., running, soccer, American football, training)		
Apparel Division Sports Category Design Team	Footwear Division Sports Category Design Team	Equipment Division Sports Category Design Team

Table 3. MS in SPD Pedagogical Model: Year One

SPD Year One		
Fall Quarter	Winter Quarter	Spring Quarter
Skill alignment	Sports apparel design invention	Sports footwear design invention
Learn foundational skills (soft goods, 3D CAD, design/research methodology, human physiology) to prepare for winter quarter’s sports apparel design invention focus	Learn sports apparel design invention and prepare for spring quarter’s footwear studio through learning human biomechanics, materials/manufacturing, and business	Learn sports footwear design invention and start exploring individual specializations through electives and independent studies

Table 4. MS in SPD Pedagogical Model: Year Two

SPD Year Two		
Fall Quarter	Winter Quarter	Spring Quarter
Sports equipment design invention	Capstone product invention research	Capstone product invention
Learn sports equipment design invention and start exploring individual specializations through electives and independent study courses	Conduct research and build a proposal for a new sports product invention	Design, develop, validate, brand, and market new product invention

For larger companies that have businesses in multiple sports categories (e.g., Nike, Adidas, Under Armour), this model is multiplied for each sports category and is what the industry calls a “category driven approach” (8). For smaller companies, there may just be one divisional design focus, such as equipment-only. For example, the Bianchi company would just have an equipment design team, as they only design and manufacture bikes. Some companies may also divide up sport categories by gender. To better explain the difference among apparel, footwear, and equipment divisions in a sports company, the following definitions were created:

1. An apparel division at a sports company is responsible for the product classifications of tops, bottoms, base layers, fleece, support/compression, outerwear, speed skins, and/or socks. The division is subdivided into sports categories and/or genders, and there will be a designer or design team (depending on the company’s size) working on products for a specific sport and/or gender. Products created in the apparel division are classified as soft goods and usually have a life span of less than three years. Designers working in this division are typically creating new product ideas based

on the athlete benefits of thermoregulation, water/wind protection, impact protection, support/compression, recovery, aerodynamics, hydrodynamics, mobility, customization, and sizing/fit/comfort.

2. Footwear divisions are responsible for creating products worn over the sock and foot and can include the design of footwear uppers, midsoles, sock liners, outsoles, and miscellaneous shoe components (e.g., heel counters, lacing systems, materials). Like apparel, this division can be subdivided into sports categories and/or genders, and there will be a designer or design team working on products for a specific sport and/or gender. Designers are typically creating new product ideas based on the athlete benefits of cushioning, flexibility, stability/support, traction/spinning, customization, and sizing/fit/comfort.
3. Equipment divisions are tasked for creating supplemental (beyond apparel and footwear) products for athletes to perform their sports. Equipment designers invent products based on the athlete needs of impact and resistance, inflatability (balls and water products), dexterity, cranial/spine protection, portability/transportability, customization, and sizing/fit/comfort.

Based on this understanding of how sports companies organize their design teams, the two-year SPD program model (Tables 3 and 4) was formed.

The fall quarter of the first year begins by aligning students to a common skill set, which can be cumulatively built upon in winter and spring quarters in the apparel and footwear studio courses. The apparel studio is sequenced first, as it builds upon the basic skills that the students have learned in fall quarter. The footwear studio is second in the sequence because it requires all of the same skills needed for the apparel studio plus 3D CAD, mechanical drafting, materials, manufacturing, and human biomechanics. In the summer of the first year, students are encouraged to take on a sports industry internship in order to network, evolve skills, and start thinking about where they want to target their careers upon graduation.

Year Two is about refining skills learned in the first year by continually building upon the knowledge

obtained in the previous year's studios. In fall term, the cohort takes the sports equipment studio, which combines the skills acquired through the apparel and footwear studios. In winter quarter, the students move into their capstone project. The goal of this project is to invent a brand-new sports product. It can be apparel, footwear, or equipment, but the new idea must be grounded in research, relevant to the market, and validated by athletes. Students are expected to write a capstone proposal, build a product design strategy, and create a making plan in winter quarter. In spring quarter, they are required to design and build the new product idea, validate it with athletes, and create a brand and marketing plan that is presented and defended at the end of the spring quarter.

COURSE OVERVIEW

The MS in SPD offers graduate students the opportunity to learn product design theories and research methodologies, innovative product development processes, sustainability principles, user-centered design principles, and consumer-focused marketing strategies in order to innovate a new product in the field of sports. With an understanding of the pedagogical goals of the integrative program, courses for the SPD program were developed. The courses are taught through studio practice and seminar format. Sixty credits are required for the master's degree in SPD. Forty-two of the required credits are under the SPD subject code, twelve of the credits are from collaborating programs, and a minimum of six credits are electives. The following tables provide an overview of the two-year curriculum (Tables 5 and 6).

DESCRIPTIONS OF REQUIRED COURSES FOR ALL SPD MAJORS

The following subsections summarize each of the required SPD subject code courses (42 of the total 60 program credits), as adopted from the approved program proposal syllabi.

SPD 684: Sports Product Design Research Methodology and Innovation Process Studio

The Sports Product Design Research Methodology and Innovation Process Studio (SPD 684) is a six-credit foundational level graduate course that focuses on the design research methodology and innovation

Table 5. Year One Curriculum: MS in SPD

SPD: Year One		
Quarter	SPD Courses	Courses from Other Programs
Fall	SPD 684: Sports Product Design Research Methodology and Innovation Process Studio (6 credits)	HPHY 631: Human Performance and Sport Products (3 credits)
		*PD 410: Soft Goods Theory (2 credits)
		*PD 410: 3D CAD (2 credits)
Winter	SPD 685: Product Design Studio I - Apparel (6 credits)	SBUS 645: Sports Product (3 credits)
	SPD 650: Sports Product Materials and Manufacturing (3 credits)	HPHY 610: Human Biomechanics (2 credits)
Spring	SPD 686: Product Design Student II - Footwear (6 credits)	Elective or Independent Study (2-6 credits)

*The PD 410 courses (Soft Goods Theory and 3D CAD) are undergraduate skill-related courses that the SPD students can elect (depending on their undergraduate degree background) to learn the necessary skills to be successful in subsequent studios.

Table 6. Year Two Curriculum: MS in SPD

SPD: Year Two		
Quarter	SPD Courses	Courses from Other Programs
Fall	SPD 687: Product Design Studio III - Equipment (6 credits)	J626: Strategic Marketing Communication (4 credits)
		Elective or Independent Study (2-6 credits)
Winter	SPD 688: Sports Product Innovation Project Strategy Development Studio (6 credits)	Elective or Independent Study (2-6 credits)
Spring	SPD 689: Collaborative Sports Product Design Creation and Launch Studio (6 credits)	Elective or Independent Study (2-6 credits)

processes used in the SPD industry. Understanding these practices is important, as they allow students to see how companies move through complex design projects and track team/individual progress (9). Each student in this course follows a specific sports product case study to understand the evolution of its history, materials and manufacturing, trends, environmental concerns, and athlete insights in order to define new design opportunities. Students also learn how to create a new sports product design innovation brief and product development timeline. This knowledge is critical for success in the courses that follow in the program.

SPD 650: Sports Product Materials and Manufacturing

SPD 650 is a three-credit course that examines the foundational theories, material factors, and processes necessary to effectively bring new SPD ideas to production. The processes of creating new sport products can be complicated, as these products are made from many different materials and engineered parts that must function together when placed into a dynamic and competitive environment. Students learn about the interconnected issues of material and manufacturing needs, including sport functionality, longevity, weight, strength, cost, testing standards, and aesthetics. Environmental impact is also addressed using the Okala Practitioner Guide, which instructs students through a methodology to innovate products with low impacts to ecological and human health (10). Ultimately, students who take this course can apply the appropriate use of materials and manufacturing processes to invent new sports products.

SPD 685: Product Design Studio I – Apparel

Studio I – Apparel (SPD 685) is the first of three, six-credit studios. In this course, students explore the link between an athlete's ability to perform successfully, the apparel products they wear, and how design can help shape the future of these interfaces. Students learn about sports apparel by conducting historical research and investigating the use and failure patterns from reclaimed apparel products to identify ways to revolutionize how these products are designed. Theories in ergonomics/fit, materials, physiology/gender, physics/kinetics, electronics/

energy, sustainability, safety, business, and creative problem solving are investigated to understand how athletic performance can be improved. Materials science, including electronic components, is explored to understand technical design requirements. The studio nature of this course encourages students to work through apparel design projects to learn about the ideation processes, pattern drafting, and construction methods to make relevant blueprints for product development. Weekly critiques, where students refine their critical thinking skills, along with multi-media presentations, improve succinct storytelling to pitch new inventions.

SPD 686: Product Design Studio II – Footwear

Studio II – Footwear (SPD 686) is the second in a series of three, six-credit studios. In this course, students explore biomechanics/mechanics, ergonomics/fit, design, research, business, sustainability, materials science, and creative problem solving methods to invent new sports footwear. Students learn specifically about footwear upper, midsole, sock liner, and outsole design parameters. As in the apparel studio, the use and failure patterns from reclaimed products are studied to identify new design opportunities. Footwear-specific mechanical theories, such as cushioning, stability, support, traction, spinning, and slipping, are evaluated in a bi-weekly cadence in order to build 3D CAD and 2D mechanical drawings. Materials science is investigated to understand technical performance and sustainability requirements. Upon completing the course, students develop a new design solution that enhances athletic performance in order to create new knowledge in the field of sports footwear design.

SPD 687: Product Design Studio III – Equipment

Studio III - Equipment (SPD 687) is the last six-credit studio in the series. In this course, students investigate the mechanical and physical performance needs related to sports equipment design, including strike-ability, inflatability, impact attenuation, dexterity, cranial protection, and portability/transportability. As in the apparel and footwear studios, historical research and the investigation of use and failure patterns from reclaimed equipment products are studied to generate new design opportunities that

enhance performance, transportation, and safety. Human anatomy, anthropometrics, and kinetics are explored as they relate to sports equipment shaping, sizing, and fit. Students learn about the equipment ideation process, pattern drafting, 3D modeling, and construction in order to accurately communicate their design concepts to others. Materials science and standardized testing methods are studied to understand technical requirements. The innovation theory called the Medici Effect and its phenomenon of “intersections” is also used to catalyze new innovative ideas for sports equipment (11-13).

SPD 688: Sports Product Design Innovative Project Strategy Development Studio

SPD 688 is part one of a two-term capstone course sequence that focuses on the alignment of design, materials, science, sustainability, research (literature and field), and business to create a new innovative product concept. The six-credit course examines the main attributes contributing to a new design idea: building a business case, devising and conducting field/literature research, synthesizing the research to build a brief, concept ideation, prototyping, and developing validation plans. The ultimate result of this course is a capstone project proposal that is shared with multi-media communication tools to peers, instructors, end users/athletes, and industry mentors. The proposal must identify a new sports design product invention opportunity that can be developed in the Collaborative Creation and Launch Studio course (SPD 689).

SPD 689: Collaborative Sports Product Design Creation and Launch Studio

This studio is a nine-credit terminal course for the MS in SPD. The studio focuses on the creation, validation, branding, and marketing of a new product invention. As a component of this execution, students collaborate with outside industry experts who serve as mentors that guide students through the invention process. The final deliverables for this capstone project include a project proposal (business case, field and user/athlete research, concept ideation, prototyping, and validation plans), prototypes, final 1:1 scale product model, usability testing/validation of the model, packaging/branding design, and final presentation to peers, instructors, end users/athletes, and industry partners.

REQUIRED COURSES FROM COLLABORATING PROGRAMS FOR ALL SPD MAJORS

Through collaborative partnerships with the departments of human physiology, journalism, and business, SPD students are required to take twelve credits of supporting courses as part of the integrative program. The specific courses are outlined in Table 7 and are described in more detail below, as adapted from the University of Oregon course catalog.

HPHY 631: Human Performance and Sport Products

This course explores the science of human physiology and how it informs sports product innovation design, development, and marketing.

Table 7. Integrative Program Courses: MS in SPD

Required Integrative Program Courses	
Quarter	Courses from Human Physiology, Sports Product Management/Business, Journalism Programs
Fall Year 1	HPHY 631: Human Performance and Sports Products (Physiology) (3 credits) SBUS 645: Sports Product (3 credits)
Winter Year 1	HPHY 610: Human Biomechanics (2 credits)
Fall Year 2	J626: Strategic Marketing Communication (4 credits)

SBUS 645: Sports Product

This course focuses on strategic and tactical issues associated with the design, manufacturing, costing, licensing, and merchandising of sports products.

HPHY 610: Human Biomechanics

This course explores the biomechanics that inform the sports industry at the level of product design, development, and marketing. Key challenges in human biomechanics, including balancing external forces (ground reaction, friction), center of mass, angular momentum, work, and energy, as well as the interplay between the human and their apparel, footwear, and equipment in multiple dimensions, will be studied from the scientist's perspective and through case studies. In addition, an overview of basic anatomy/injuries of the upper extremities, lower extremities, and spine will be discussed.

J626: Strategic Marketing Communication

This course covers the examination, evaluation, and integration of advertising, public relations, sales promotion, direct marketing, social media, sponsorship and events, packaging, customer service, and personal selling.

ELECTIVE COURSES FOR ALL SPD MAJORS

Through the relationships established with the departments of journalism, business, and management, electives were also identified (Table 8). Students in the SPD program can take a minimum of six credits

as electives. These electives have no prerequisites and allow students to specialize in areas of business or communication, depending on where their career interests may be. Students may also take independent study credits within the SPD program to specialize in specific research/design topic areas.

FUNCTIONAL SUMMARY OF COURSEWORK

Another way of looking at the pedagogical SPD program model is through function. Functionally, the program is divided into the following parts (see also Table 9):

1. Foundational coursework: For first year students entering into the program to help level-set on the processes and skills needed to succeed throughout the rest of the SPD program (with the exception of J 626: Strategic Marketing Communication, which is taken in fall term of the second year).
2. Theoretical/studio practice coursework: Division-specific design studios (apparel, footwear, and equipment) are required for all SPD students to learn how to solve performance problems by product classification and scientific needs. Studio courses are meant to be project-based and simulate projects that would occur in a real-life sports product design industry setting.
3. Capstone coursework: Individual student-focused research based capstone design invention projects.

Table 8. Possible Electives for the MS in SPD

Electives	
Quarter	Journalism and Business Programs
Winter Year One or Two	J 624: Strategic Communication: [Topic] (2 credits) ACTG 662: Strategic Cost Management (4 credits)
Spring Year One or Two	J 616: Introduction to Strategic Communication Marketing (4 credits) J 624: Strategic Communication: [Topic] (2 credits) MGMT 614: Strategic Management (3 credits)
Fall Year Two	J 621: Foundations of Strategic Communication (4 credits) J 624: Strategic Communication: [Topic] (2 credits) MGMT 641: Industrial Ecology (3 credits) MGMT 625: New Venture Planning (3 credits)

Table 9. Functional Summary of SPD Coursework

	Foundational Coursework	Theoretical and Studio Practice Coursework	Capstone Coursework	Elective Coursework
Credits	21 credits total	18 credits total	15 credits total	6 credit minimum
Pedagogical Goals	Foundational courses that prepare SPD	SPD-specific studio courses that focus on students for all other courses in the program's curriculum	Capstone courses that align design, design theories, and methodologies relevant to sports product design	Elective courses to supplement each student's studies. Students can also take independent study credits to specialize in a specific topic
Courses	SPD 684: Sports Product Design Research Methodology and Innovation Process Studio (6 credits) SPD 650: Sports Product Materials and Manufacturing (3 credits) SBUS 645: Sports Product (3 credits) HPHY 631: Human Performance and Sports Products (3 credits) HPHY 610: Human Biomechanics (2 credits) J 626: Strategic Marketing Communication (4 credits)	SPD 685: Product Design Studio I (6 credits) SPD 686: Product Design Studio II (6 credits) SPD 687: Product Design Studio III (6 credits)	SPD 688: Sports Product Design Innovative Project Strategy Development Studio (6 credits) SPD 689: Collaborative Sports Product Design Creation and Launch Studio (9 credits)	ACT G662: Strategic Cost Management (4 credits) J 616: Introduction to Strategic Communication Marketing (4 credits) J 621: Foundations of Strategic Communication (4 credits) J 624: Strategic Communication: [Topic] (2 credits) MGMT 614: Strategic Management (3 credits) MGMT 625: New Venture Planning (3 credits) MGMT 641: Industrial Ecology (3 credits)

Table 10. Application Requirements for the Sports Product Design Graduate Program

SPD APPLICATION REQUIREMENTS		
General Demographic Information (age, gender, ethnicity, etc.)	Academic Status (graduation date, major, GPA, schools attended)	Transcript(s)
Resume/CV	GRE Score (optional)	Work/Internship/Personal Experience (related to SPD)
Portfolio (design process, prototyping, and storytelling abilities)	Academic Status (graduation date, major, GPA, schools attended)	Transcript(s)

4. Elective coursework: Supplemental learning opportunities for students to better focus in a specific area of interest.

PROGRAM LOCATION, ADMISSION, AND RESIDENCY REQUIREMENTS

Location within the University

The SPD graduate program is housed within the Department of Product Design, which is situated within the College of Design—one of the university's eight major academic units. The College of Design was founded in 1914 and is dedicated to “advancing the understanding, value, and quality of visual culture and the built, natural, and social environments through excellent and distinctive teaching, research, and creative endeavors.” The college's departments include architecture, interior architecture, landscape architecture, historic preservation, art, product design, art and technology, history of art and architecture, planning, public policy and management, and arts and administration (14).

The SPD program is physically located on the University of Oregon's Portland campus (the main campus is two hours south in Eugene, Oregon), which is centrally located as relates to the sports industry. The Portland campus is located in the historic White Stag building and has been offering degree programs since 2008. Undergraduate and graduate degree programs in architecture, product design, multimedia journalism, strategic communication, law, executive MBA, and sports product management all exist on the Portland campus and allow for the SPD program to be taught with an integrative approach. Academically, this enables instructors who have subject and sports product industry expertise to teach courses. The location also allows students to be better connected with sports industry experts who can easily commute to the university to be guest lecturers and mentors. Students also have access to relevant industry-led research projects, internships, and networking activities.

Admission Requirements

In order to apply to the program, prospective students must hold a bachelor's degree from an accredited four-year college or university in the

U.S. or its equivalent from a foreign country. They must submit online applications to the University of Oregon Graduate School and to the SPD program. Applicants must meet the requirements listed in Table 10. International students have additional application requirements, including TOEFL® scores if their native language is not English and the demonstration of financial resources to pay for admission.

Residency Requirements (per the University of Oregon's Graduate School)

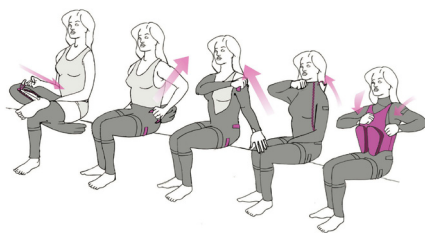
All accepted master's degree students at the University of Oregon must complete their program work within seven years, including transferred credits, capstone project, and examinations. The Graduate School requires that a minimum of thirty credits (applicable to degree requirements) be taken at the University of Oregon during at least two terms of study. SPD students must maintain at least a 3.0 grade point average in their degree programs, per University of Oregon Graduate School requirements. Grades of D+ or less are not accepted for credit but are computed in the GPA. Similarly, the grade of N (no pass) is not accepted for credit. A grade of pass (P) must be equal to or better than a B-. A GPA below 3.0 at any time during an SPD student's studies or the accumulation of more than five credits of N or F grades—regardless of the GPA—is considered unsatisfactory. The dean of the Graduate School, after consultation with the student's home department, may drop the student from the program, thus terminating the student's degree (15).

PROGRAM APPROVALS

While the SPD program was in a draft format, it was presented through focus groups conducted by the Department of Product Design with sports industry experts in design and product innovation. The focus group process allowed for feedback and validation of the pedagogical model. There were several other approvals needed throughout the proposal creation process to ensure that the new curriculum and program satisfied school, university, and state standards. The curriculum was reviewed and approved by the College of Design and the curriculum committee at the University of Oregon. The program proposal was also reviewed and approved by

**Dynamic Walking Cane**

UO Grad Student: Jacob Winkler

**Adaptive Surf Wetsuit**UO Grad Students: Drew McGrath, Nick Cantrell
& Natasha Anand**Prosthetic Leg/Foot for Sport**

UO Grad Student: Alex Hill

Figure 2. Examples of SPD program student inventions.

the Graduate School, Senate, and Board of Trustees of the University of Oregon. In addition to university approvals, the program was reviewed and approved by the Provost's Council and the Oregon Higher Education Coordinating Commission.

PROGRAM PROGRESS AND CONCLUSION

Upon final curriculum and program approvals, applications were accepted for the first cohort of students in May 2016. The new program commenced in September 2016 with six male students, who were admitted from around the U.S. with varying backgrounds in design, engineering, art, and entrepreneurship. The second cohort, in 2017, included eleven students (four women and seven men), and the third cohort for fall 2018 consists of sixteen (eight women and eight men). Along with students from the U.S., there are now ones from Denmark, Hong Kong, Scotland, China, and Canada. As SPD grows and becomes more internationally recognized, its goals include influencing the gender and minority gaps in academia and the sports industry by attracting more women and students of color. SPD has the opportunity to transform the culture of the sports industry.

Since the inception of the program, the students have been very successful at inventing new performance products for athletes (Figure 2). They have been finalists and winners of several design innovation competitions, including Quackcon, DOD Proof Challenge, Woolmark Performance Challenge, and Create4. They have also been sought after for internships and employment post-graduation with major

sport product manufacturers. Some are working for start-ups. Industry partners have commented that SPD students have excellent skills in researching, storytelling, and presenting, along with the ability to invent and prototype commercially relevant soft and hard good products for athletes. Anecdotal evidence directly from SPD alums also indicates that the program is heading in the right direction, as they explain they are more well-rounded and can take on different design tasks because of their fluidity working between mediums and technologies. They also have been recognized for strong prototyping skills and have shared that they better understand the levers that affect athletic performance because of their knowledge of human physiology, biomechanics, materials, and manufacturing.

Program-wise, a second tenure-track faculty member was hired in 2018 to share course load and help further develop the program. Immediately, there is a desire to improve student capabilities with algorithmic design tools and bio-based materials development through the existing curriculum. When feasible, new classes may be added to support the ever-evolving sports industry. As the program is fairly new, and there are a limited number of graduates (there are only six), the next step of this work would be to quantify student placement and success through a qualitative study. The research would include interviewing SPD alums, asking them how the curriculum served them in industry, and finding out how their skills differ from colleagues from other academic programs. Employers would be also be interviewed to understand their perceptions of SPD hires.

In addition to their studies, SPD students are

involved with the community. They teach K-12 students about sports product design, participate in annual Design Week Portland Workshops, and take part in a Maker Faire at the local science museum, OMSI. Through these educational opportunities, students have interfaced with over 1,000 children and hope to continue this work through the support of science, technology, engineering, and mathematics related funding. These experiences also provide a platform for the students to practice teaching and communicating to others about inventing. For more information about the SPD program, see <http://pd.uoregon.edu/sports-product-design>.

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